

[0106] Referring now to FIG. 27, a user interface 2700 is shown illustrating a day view, according to an exemplary embodiment. The day view 2700 illustrates occupancy being detected midway during a scheduled away event. The occupancy detection block appears over the scheduled away event. The hours of energy saved can be updated based on when occupancy is detected. The occupancy block indicates zero hours of energy saved for a portion of the scheduled away event.

[0107] Referring now to FIG. 28, a user interface 2800 is shown illustrating a day view, according to an exemplary embodiment. The day view 2800 illustrates occupancy being detected at the beginning of a scheduled away event. The occupancy detection block shows zero hours of energy saved for the entire scheduled away event.

Configuration of Exemplary Embodiments

[0108] The construction and arrangement of the systems and methods as shown in the various exemplary embodiments are illustrative only. Although only a few embodiments have been described in detail in this disclosure, many modifications are possible (e.g., variations in sizes, dimensions, structures, shapes and proportions of the various elements, values of parameters, mounting arrangements, use of materials, colors, orientations, etc.). For example, the position of elements may be reversed or otherwise varied and the nature or number of discrete elements or positions may be altered or varied. Accordingly, all such modifications are intended to be included within the scope of the present disclosure. The order or sequence of any process or method steps may be varied or re-sequenced according to alternative embodiments. Other substitutions, modifications, changes, and omissions may be made in the design, operating conditions and arrangement of the exemplary embodiments without departing from the scope of the present disclosure.

[0109] The present disclosure contemplates methods, systems and program products on any machine-readable media for accomplishing various operations. The embodiments of the present disclosure may be implemented using existing computer processors, or by a special purpose computer processor for an appropriate system, incorporated for this or another purpose, or by a hardwired system. Embodiments within the scope of the present disclosure include program products comprising machine-readable media for carrying or having machine-executable instructions or data structures stored thereon. Such machine-readable media can be any available media that can be accessed by a general purpose or special purpose computer or other machine with a processor. By way of example, such machine-readable media can comprise RAM, ROM, EPROM, EEPROM, CD-ROM or other optical disk storage, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to carry or store desired program code in the form of machine-executable instructions or data structures and which can be accessed by a general purpose or special purpose computer or other machine with a processor. When information is transferred or provided over a network or another communications connection (either hardwired, wireless, or a combination of hardwired or wireless) to a machine, the machine properly views the connection as a machine-readable medium. Thus, any such connection is properly termed a machine-readable medium. Combinations of the above are also included within the scope of machine-readable media. Machine-executable instructions include,

for example, instructions and data which cause a general purpose computer, special purpose computer, or special purpose processing machines to perform a certain function or group of functions.

[0110] Although the figures show a specific order of method steps, the order of the steps may differ from what is depicted. Also two or more steps may be performed concurrently or with partial concurrence. Such variation will depend on the software and hardware systems chosen and on designer choice. All such variations are within the scope of the disclosure. Likewise, software implementations could be accomplished with standard programming techniques with rule based logic and other logic to accomplish the various connection steps, processing steps, comparison steps and decision steps.

What is claimed is:

1. A method for determining energy savings of a thermostat, the method comprising:
 - obtaining, by one or more processing circuits of the thermostat, first data indicating an actual length of time that building equipment operated to heat or cool a building space associated with the thermostat;
 - identifying, by the one or more processing circuits of the thermostat, a thermal model representative of the building space and the building equipment;
 - detecting, by the one or more processing circuits of the thermostat, occupancy in the building space, wherein the thermostat is configured to automatically transition the building equipment to a low energy mode when no users are detected in the building space;
 - generating, by the one or more processing circuits of the thermostat and based on the thermal model and the occupancy of the building space, an estimated amount of time that the building equipment would operate to heat or cool the building space at a particular setpoint value;
 - displaying, via a user interface, a graph indicating one or more time periods where occupancy was detected in the building space, and indicating an amount of time saved by automatically transitioning the equipment to the low energy mode, wherein the amount of time saved is determined based on the difference between the actual length of time that the building equipment operated and the estimated amount of time.
2. The method of claim 1, further comprising identifying, by the one or more processing circuits, the thermal model from environmental data and control outputs of the thermostat via a stochastic parameter estimation method.
3. The method of claim 2, wherein the method further comprises updating and re-identifying the thermal model based on additional environmental data and additional control outputs of the thermostat collected over a period of time.
4. The method of claim 2, wherein the stochastic parameter estimation method is at least one or a combination of linear least squares, non-linear least squares, a variants least square method, a robust linear least squares method, and a robust non-linear least squares method.
5. The method of claim 1, further comprising:
 - generating a set of model parameters for the thermal model based on at least the first and second sets of model parameters for the thermal model and non-linear least squares.
6. The method of claim 5, wherein generating the set of model parameters for the thermal model comprises itera-